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Evaluation of the Feasibility of an Early Decision and Permanent Remedy for Tank Farm Soil

June 2004

Idaho Completion Project

Bechtel BWXT Idaho, LLC

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Idaho Completion Project
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
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ABSTRACT

In the Agreement to Resolve Dispute for Operable Unit 3-13 at the Waste Area Group 3, the United States Department of Energy Idaho Operations Office; United States Environmental Protection Agency, Region 10; and Idaho Department of Environmental Quality (i.e., the Agencies) agreed to evaluate accelerating the selection and implementation of the permanent remedy for the tank farm soil and to work collaboratively to expedite a permanent remedy. An early decision would eliminate the requirement to install an infiltration barrier over the remaining areas in the tank farm as the tanks are closed.

This document evaluates the feasibility of accelerating the selection and implementation of a permanent remedy for the tank farm soil. To perform this evaluation, the requirements of regulatory programs were considered as well as the timing of, and constraints imposed by, operations, cleanup, and closure activities planned for the tank farm.

In 1999, data gaps and uncertainties associated with the tank farm soil prevented the Agencies from reaching a decision on the permanent remedy in the Operable Unit 3-13 Record of Decision. Since 1999, new information has been collected from cleanup, operation, and maintenance activities and from an extensive search of historical records and interviews with personnel involved in tank farm activities. The Agreement to Resolve Dispute requires the Department of Energy to determine whether accelerating the completion of a Record of Decision for a permanent remedy is possible with a goal of December 31, 2006. The feasibility of acceleration depends upon the extent of data collection necessary to support a decision.

The possibility of accelerating the permanent remedy was also evaluated. Four options for the first phase of a remedy were evaluated: hot spot removal, hot spot treatment, capping the west end of the tank farm, and early capping of the entire tank farm. Implementation of the final remedy is difficult due to void spaces and active tank farm infrastructures, which run through the tank farm and are required to support tank farm activities until the tank farm is closed. Hot spot treatment is estimated to cost $18M, and hot spot removal is estimated to cost $15M. Early implementation of a phased permanent cap is feasible if the void spaces are filled and the infrastructure replaced. To cap the west end of the tank farm early, tank closure activities would need to be re-sequenced. The additional costs that would be incurred to accelerate capping the west end of the tank farm are estimated to be $28M because the piping and infrastructure would have to be replaced. The additional costs that would be incurred to accelerate capping the entire tank farm are roughly $73M. The four options will be further evaluated and these rough order-of-magnitude estimates determined more precisely in the feasibility study.

CONTENTS

FIGURES

ACRONYMS

BRA	baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOE Idaho	U.S. Department of Energy Idaho Operations Office
DQOs	data quality objectives
IDEQ	Idaho Department of Environmental Quality
INTEC	Idaho Nuclear Technology and Engineering Center
K_d	soil-water distribution coefficient
NWCF	New Waste Calcining Facility
OU	operable unit
PEW	process equipment waste
RCRA	Resource Conservation and Recovery Act
RI/BRA	remedial investigation and baseline risk assessment
RI/FS	remedial investigation and feasibility study
ROD	Record of Decision
SBW	sodium-bearing waste

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1. INTRODUCTION

This document evaluates the feasibility of (1) accelerating the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision (ROD) for the tank farm soil from the enforceable date of May 2010 and (2) expediting an early phased remedy. In an "Agreement to Resolve Dispute" (DOE 2003), the U.S. Environmental Protection Agency, Idaho Department of Environmental Quality (IDEQ), and U.S. Department of Energy Idaho Operations Office (DOE Idaho) (collectively known as the Agencies) agreed to a planned date of December 31, 2006, for completion of an early ROD. The Agencies also agreed to refine the planned date for the Operable Unit (OU) 3-14 ROD after the revised data quality objectives (DQOs) are established (Section 3.3.1 of the "Agreement to Resolve Dispute" [DOE 2003]). If any party deems it infeasible to pursue an early permanent remedy, DOE Idaho will install an infiltration barrier over the remaining areas in the tank farm as the tanks are closed.

The Agencies agreed to work collaboratively to expedite a phased implementation of the tank farm soil permanent remedy. Four options are evaluated: (1) source removal, (2) in situ hot spot treatment, (3) re-sequencing tank closures to close the west end of the tank farm first, and (4) accelerating tank farm closure by constructing a new tank farm.

2. BACKGROUND

The tank farm is located within the Idaho Nuclear Technology and Engineering Center (INTEC) Waste Area Group 3 at the Idaho National Engineering and Environmental Laboratory. OU 3-13 includes the Comprehensive Remedial Investigation and Feasibility Study (RI/FS) (DOE-ID 1997) and associated activities for Waste Area Group 3. During development of the OU 3-13 ROD, the Agencies determined that data gaps remained which prevented them from reaching a remedial decision on the tank farm soil and a final decision on the groundwater inside the INTEC fence. The Agencies created OU 3-14 to address these sites. The known contaminated soil sites being addressed under OU 3-14 are shown on Figure 2-1, along with the adjacent buildings.

Other tank closures, remediation, and operational activities occur within the boundaries of OU 3-14. The tank farm includes 11 belowground 300,000-gal and 318,000-gal tanks (referred to as the 300,000-gal tanks) and four 30,000-gal tanks (see Figure 2-1), which are regulated under the Resource Conservation and Recovery Act (RCRA). The 300,000-gal tanks were constructed from 1951 through 1964 and were used to support nuclear fuel reprocessing operations at INTEC from 1952 until 1992. The tanks stored high-level waste solutions until it was converted to a solid (called calcine). The tank farm is currently used to store waste produced from second- and third-cycle extraction raffinates and other liquid wastes generated from INTEC operations, such as off-gas treatment, facility and equipment decontamination, process equipment waste (PEW) evaporator concentrates, and laboratory operations.

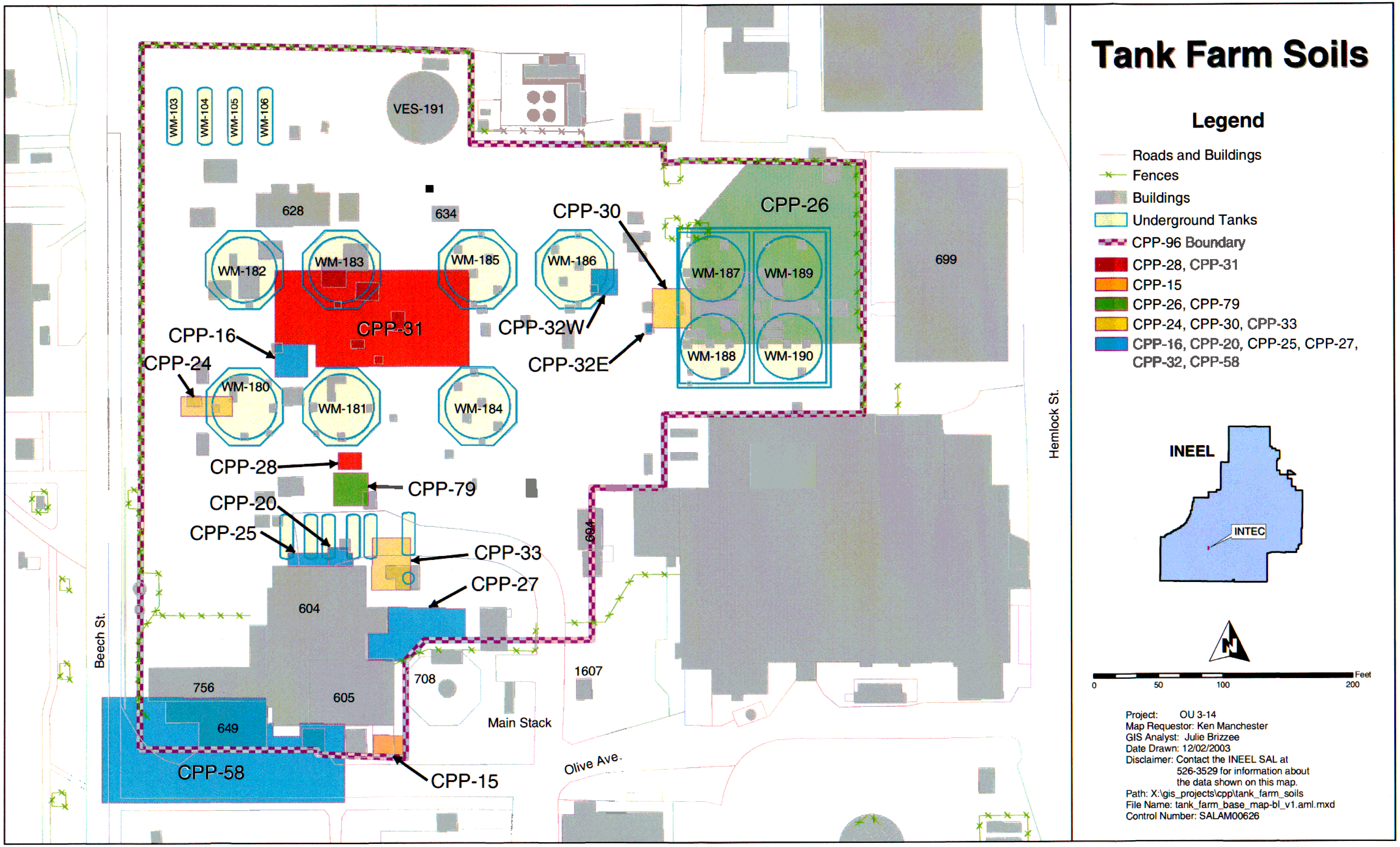

Figure 2-1. Map of the contaminated tank farm soil sites and key structures.

3. EARLY ROD FOR TANK FARM SOIL

The Agencies worked collaboratively on developing the DQOs and associated scope to conduct a RI/FS for OU 3-14 (see revised OU 3-14 RI/FS Work Plan [DOE-ID 2004]). A schedule to meet the DQOs and complete the RI/FS is provided (see Table 7-1 of the RI/FS Work Plan). This schedule integrates the tank-farm-related activities, such as tank closure activities, installation of an infiltration barrier, and RI/FS field investigations, to prevent scheduling conflicts between the different tank farm activities. The schedule also coordinates with other CERCLA activities, such as OU 3-13 Group 4 (Perched Water) investigations. OU 3-14 would provide data to be used in a revised INTEC groundwater model, which would in turn provide data for the OU 3-14 Baseline Risk Assessment (BRA). The model would be used in OU 3-14 to evaluate remedial alternatives in the FS. The schedule shows a draft OU 3-14 ROD by the enforceable date of May 2010. This paper develops an acceleration strategy to complete a draft ROD by the planned date of 2006 and then evaluates the feasibility of implementing an early permanent remedy for tank farm soils.

An early ROD for the tank farm soil is feasible if Phases I and II data collection, INTEC modeling, and BRA can be accelerated to begin in FY-04. The OU 3-14 RI/FS data, which would be collected concurrently with the modeling and BRA, would be used to verify the model output or modify the model input. The requirements to meet an accelerated ROD are outlined below:

- Accelerate the OU 3-14 BRA.
- Accelerate the INTEC groundwater model—New data have been collected since the OU 3-13 RI/BRA, which are inconsistent with the original modeling assumptions and results. Data have been collected that demonstrate where the model under-predicted, as well as over-predicted, contaminant concentrations. The groundwater model will be revised to incorporate new perched water and groundwater data and estimated source terms to improve the predictive ability of the model and better match historical data.
- Use reasonably conservative estimates for unknown parameters—Some parameters have high uncertainty associated with their estimation due to the lack of data. Estimates for these parameters will be reasonably bounded using conservative estimates based on physical constraints, published literature, and process knowledge, where possible. Where it is not possible to place an upper bound on a parameter estimate, assumptions will be made that can be verified during the data-gathering phase. Parameters with the highest uncertainty are
    - CPP-79 source term for the deep site—At Site CPP-79, an anomalously high radiation reading occurred at the bottom of a probehole. The radioactivity levels do not appear to be similar to the shallow release at the site, which is well characterized. A reasonably conservative estimate will be assumed for this deep site, which will be based on physical constraints that bound the contamination (such as adjacent buildings, extent of known excavations, and data from probeholes). Concurrent field investigations will determine the nature and extent of contamination for verification and, if necessary, revision of the groundwater model.
    - Plutonium sorption—The soil-water distribution coefficient (K_d) is a term used in modeling to quantify the ability of geologic materials to retard the movement of a contaminant. The OU 3-13 ROD selected a conservative distribution coefficient used in screening models. The distribution coefficient for plutonium has not been measured using INTEC alluvium. Since the 1999 ROD signature (DOE-ID 1999), technical reports have been published in the literature and additional laboratory studies have been conducted. Reasonably

conservative estimates of the distribution coefficient for plutonium and other contaminants will be based on published literature and laboratory studies.

- Technetium-99 source term—Technetium-99 was measured in the Snake River Plain Aquifer near the tank farm above drinking water standards in 2003. Reasonably conservative estimates for the source term will be based on the results of the Tc-99 Phase I field investigation conducted in fall 2003 and process knowledge.

- INTEC water balance—Perched water exists beneath the INTEC tank farm that can transport contaminants to the Snake River Plain Aquifer. The source and quantity of the water is not always known. The INTEC water balance study that is being conducted under OU 3-13 Group 4, Perched Water, will quantify some INTEC water losses. Metering of other sources will be implemented in fiscal year 2004. These data will be used to reduce uncertainty in the model.

- Moisture and infiltration rates—Infiltration rates and moisture characteristic curves will be estimated from existing data and literature.

- Verify groundwater model input and output with OU 3-14 RI/FS data—Once the INTEC model has been refined and data collected, the model input and output will be verified using the newly acquired data.

- Perform post-ROD data collection—Data will be collected during the RD/RA phase to further refine parameters as necessary.

A decision diagram (Figure 3-1) and an accelerated schedule (Figure 3-2) are presented. This approach has the potential to achieve an early ROD for the tank farm soils and meet the acceleration goal in the Agreement to Resolve Dispute for the Tank Farm Interim Action. Key points to the accelerated schedule are described below:

- The groundwater modeling and BRA will begin following approval of the OU 3-14 RI/FS Work Plan. This effort will use available information and reasonably conservative assumptions to develop the BRA for the tank farm soils.

- The OU 3-14 data collection activities, including both the RI and FS components, will begin following completion of the RI/FS Work Plan and be used to verify the model parameters and results and the BRA. This information will be compared to the reasonably conservative assumptions used in the model and BRA and the necessary adjustments made.

- The BRA report, a Federal Facility Agreement/Consent Order (DOE-ID 1991) secondary document, will be submitted to the Agencies for approval in March 2005. This report will describe the baseline risk from the tank farm soils and help to determine whether a final remedy can be selected with existing data. If sufficient information is available to select a remedy for the tank farm soils, then a RI/FS, Proposed Plan, and OU 3-14 ROD will be prepared to achieve an early decision for the tank farm soils.

- If additional data collection, treatability study, or evaluation were required, then a treatability study work plan, and/or revision to the OU 3-14 RI/FS Work Plan, would be prepared. This would result in an OU 3-14 ROD post-2006 and the date would depend on the amount of data gaps needing to be filled. The ROD enforceable date would remain May 2010, consistent with the existing enforceable milestone in the OU 3-14 RI/FS Work Plan.

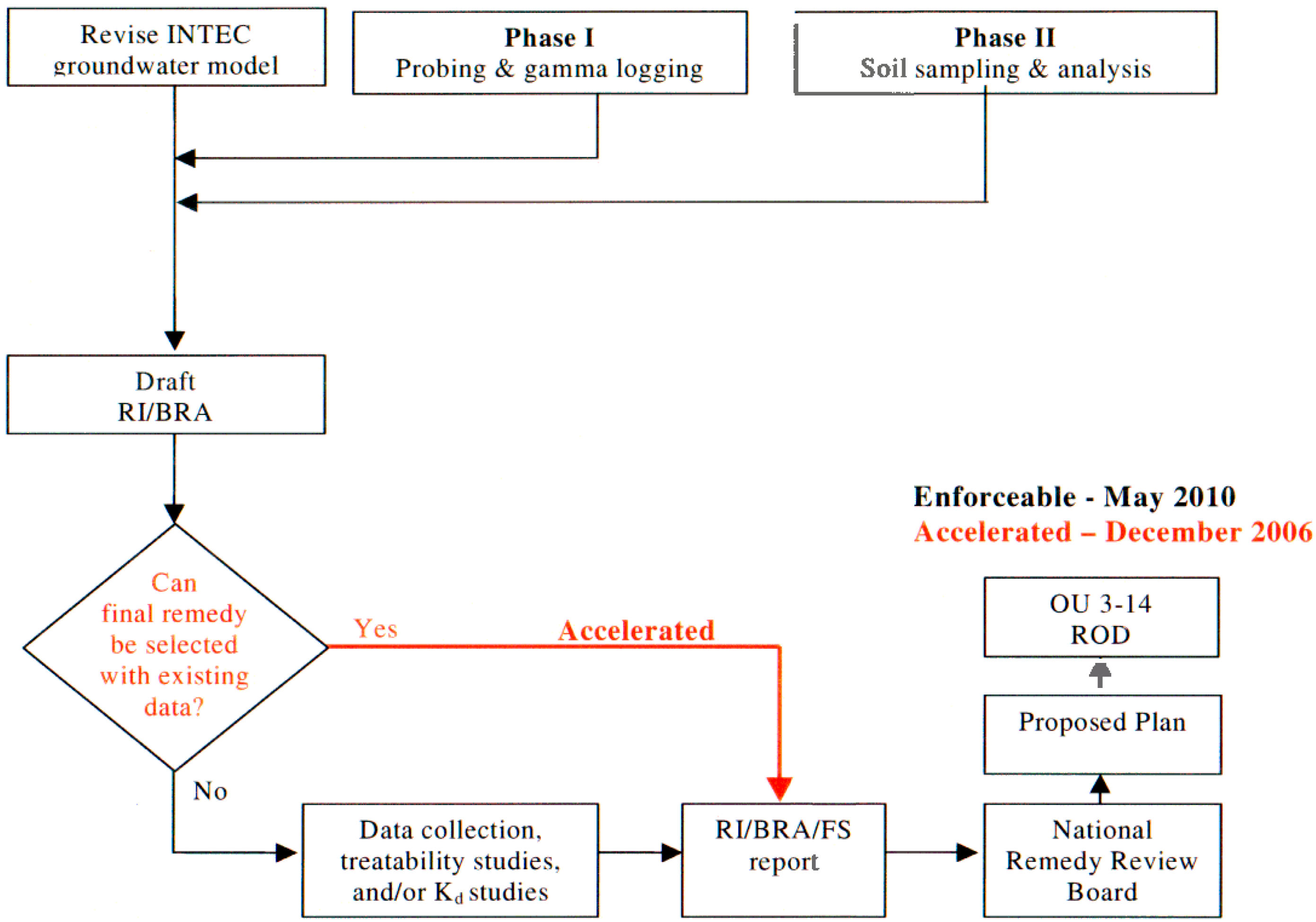

Figure 3-1. Decision diagram showing accelerated tasks.

ID	Task Name	Duration	Start	Finish
1	**OU 3-14 Tank Farm Soils Remediation**	**837 days**	**Mon 12/22/03**	**Fri 4/27/07**
2	**RI/FS Work Plan/FSP**	**113 days**	**Mon 12/22/03**	**Mon 6/7/04**
3	Draft RI/FS WP/FSP to DOE-ID, EPA, IDEQ	0 days	Mon 12/22/03	Mon 12/22/03
4	Agency review of Draft RI/FS WP/FSP	27 days	Mon 12/22/03	Thu 2/5/04
5	DOE Approved review extension of Draft RI/FS WP/FSP	15 days	Fri 2/6/04	Thu 2/26/04
6	Resolve Draft RI/FS WP/FSP comments	32 days	Fri 2/27/04	Mon 4/12/04
7	Resolve Draft RI/FS WP/FSP comments extention	15 days	Tue 4/13/04	Mon 5/3/04
8	Agency review of Draft Final RI/FS WP/FSP	12 days	Tue 5/4/04	Wed 5/19/04
9	Resolve Draft Final RI/FS WP/FSP comments	12 days	Thu 5/20/04	Mon 6/7/04
10	Final Tank Farm Soils RI/FS Work Plan/FSP	0 days	Mon 6/7/04	Mon 6/7/04
11	**Remedial Investigation**	**227 days**	**Fri 3/5/04**	**Mon 1/31/05**
12	Install, sample & gamma-log probeholes	147 days	Fri 3/5/04	Thu 9/30/04
13	Soil sample analysis and validation	80 days	Fri 10/1/04	Mon 1/31/05
14	**Develop Vadose Zone Model**	**232 days**	**Fri 2/27/04**	**Mon 1/31/05**
15	Develop Vadose Zone Model	152 days	Fri 2/27/04	Thu 9/30/04
16	Calibrate VZ Model	80 days	Fri 10/1/04	Mon 1/31/05
17	**RI/BRA Report**	**144 days**	**Fri 10/29/04**	**Fri 5/27/05**
18	Prepare RI/BRA Report	100 days	Fri 10/29/04	Mon 3/28/05
19	Draft RI/BRA Report to DOE-ID, EPA, IDEQ (Secondary)	0 days	Mon 3/28/05	Mon 3/28/05
20	Review RI/BRA Report	44 days	Tue 3/29/05	Fri 5/27/05
21	Final RI/BRA Report	0 days	Fri 5/27/05	Fri 5/27/05
22	**RI/FS Report**	**174 days**	**Tue 3/29/05**	**Fri 12/2/05**
23	Prepare RI/FS Report	90 days	Tue 3/29/05	Wed 8/3/05
24	Draft RI/FS Report to DOE-ID, EPA, IDEQ (Primary)	0 days	Wed 8/3/05	Wed 8/3/05
25	Review RI/FS Report	84 days	Thu 8/4/05	Fri 12/2/05
26	Final RI/FS Report	0 days	Fri 12/2/05	Fri 12/2/05
27	**EPA National Remedy Review Board (NRRB)**	**80 days**	**Mon 12/5/05**	**Fri 3/31/06**
28	Develop NRRB Briefing Package	10 days	Mon 12/5/05	Fri 12/16/05
29	Draft NRRB Presentation to EPA (Other)	0 days	Fri 12/16/05	Fri 12/16/05
30	Review NRRB Briefing Package	60 days	Mon 12/19/05	Fri 3/17/06
31	Conduct NRRB Meeting	10 days	Mon 3/20/06	Fri 3/31/06
32	**Proposed Plan**	**126 days**	**Mon 3/6/06**	**Wed 8/30/06**
33	Prepare Proposed Plan	60 days	Mon 3/6/06	Fri 5/26/06
34	Draft Proposed Plan to DOE-ID, EPA, IDEQ (Secondary)	0 days	Fri 5/26/06	Fri 5/26/06
35	Review Proposed Plan	44 days	Tue 5/30/06	
36	Proposed Plan Public Comment Period	22 days	Tue 8/1/06	Wed 8/30/06
37	Final Proposed Plan	0 days	Wed 8/30/06	Wed 8/30/06
38	**Record of Decision**	**163 days**	**Thu 8/31/06**	**Fri 4/27/07**
39	Prepare Record of Decision	79 days	Thu 8/31/06	Fri 12/22/06
40	Draft Record of Decision to Agencies (Primary)	0 days	Fri 12/22/06	Fri 12/22/06
41	Review ROD	84 days	Tue 1/2/07	Fri 4/27/07
42	Final ROD to Agencies	0 days	Fri 4/27/07	Fri 4/27/07

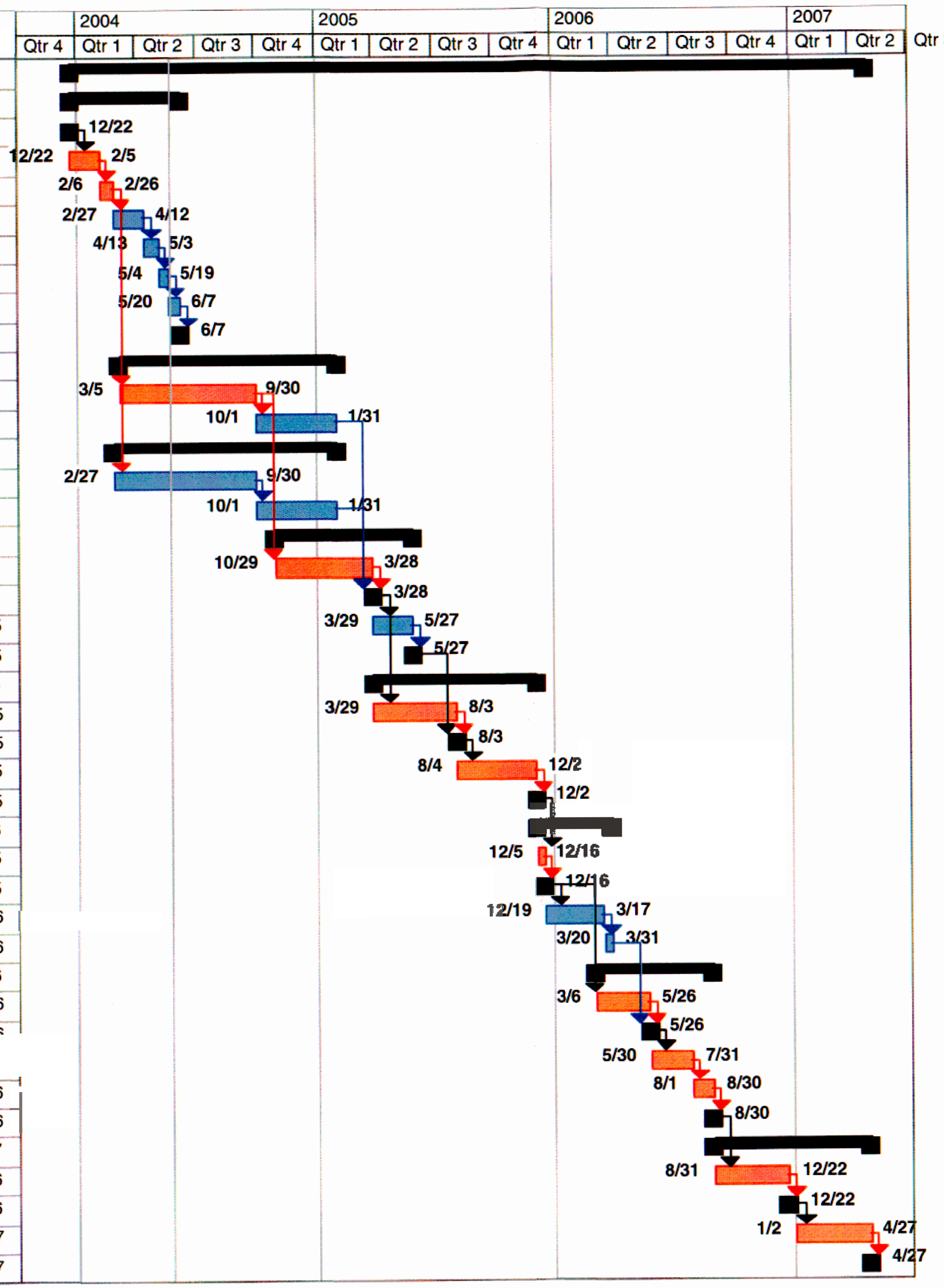

Figure 3-2. Accelerated schedule for early decision and permanent remedy.

4. EVALUATION OF AN EXPEDITED, PHASED IMPLEMENTATION OF A PERMANENT TANK FARM SOIL REMEDY

The "Agreement to Resolve Dispute" (DOE 2003) stated that DOE Idaho, Environmental Protection Agency, and IDEQ agree to work collaboratively to expedite a phased implementation of the tank farm soil permanent remedy. The Agreement to Resolve Dispute also states that the sequencing of tank closures and the schedule for tank farm soil remediation will be integrated to occur in stages. The implementation of the remedy is constrained by the sequencing of the tank closures as well as by operational constraints associated with an active facility. The remainder of Section 4 describes the constraints and then evaluates options for accelerating implementation of the permanent remedy if the constraints can be mitigated.

4.1 Operational Constraints

Implementation of an early permanent remedy is complicated by the presence of operating tanks, pipes, and valves; activities associated with tank cleaning and RCRA closure; and the uncertainty in the final end state of the tank heels. These constraints are described in Sections 4.1.1 and 4.1.2.

4.1.1 Active Facility Operations

A significant constraint for the early remedy implementation is related to the ongoing operations at the tank farm. The Safety Analysis Report for the Tank Farm evaluates the hazards and imposes administrative controls to protect the tank farm tanks, vaults, liner, lines, and other infrastructure (SAR-107). Controls will be imposed to prevent workers from becoming overexposed to radiation during sampling activities and may prevent work in certain contaminated areas. Static and dynamic load restrictions will apply to all activities within the tank farm. Anticipated airborne releases of contaminants during drilling may require enclosures to control the dust, but these could interfere with the use of the overhead cranes necessary for grouting or other tank closure activities.

Besides constraints imposed by SAR-107, other operational constraints relate to the infrastructure at the tank farm that supports active operations and tank closure activities. The tanks are being closed in phases, during which time other tanks and ancillary systems remain active to allow the collection and transfer of wastes and flush solutions.

INTEC operations currently use the liquid waste management system, consisting of the evaporator tank system (also known as the high-level liquid waste evaporator), the PEW evaporator, and Liquid Effluent Treatment and Disposal (facility). During reprocessing of spent nuclear fuel, liquid waste was stored temporarily at the tank farm and later transferred to the New Waste Calcining Facility (NWCF) for solidification. The 1995 Settlement Agreement (DOE 1995) required the tank farm non-sodium-bearing waste to be calcined by June 30, 1998, and treatment of sodium-bearing waste (SBW) by December 31, 2012. The calcining of the non-SBW was accomplished in February 1998. However, with the shutdown of the NWCF calciner system in June 2000, the remaining SBW at the tank farm has no treatment path forward. The NWCF calciner system is currently undergoing RCRA closure. The SBW treatment will be selected and implemented based on the future Idaho High-Level Waste and Facility Disposition Environmental Impact Statement ROD. There are potential interface issues with the lines that run between the tank farm and the NWCF evaporator tank system. These lines are used to evaporate tank flush solutions and receive evaporator bottoms.

The PEW system also receives radioactive liquid waste for evaporation. The PEW system is situated in Buildings CPP-604/605 adjacent to the tank farm (see Figure 2-1). There are three 18,000-gal PEW tanks (WM-100 through WM-102) and associated valve boxes, encasements, and piping that were at one time considered part of the tank farm system. These tanks, located within the waste treatment building (CPP-604), are no longer considered part of the tank farm system. It is anticipated that the PEW system will continue operating to support INTEC after the tank farm is closed in 2012. The three PEW tanks, along with five support tanks (WL-101, WL-102, WL-132, WL-133, and a new tank, WL-111), are being permitted as part of the PEW system. As with the NWCF lines, radioactive liquid waste lines cross the tank farm to reach the PEW system that may interfere with early implementation of a physical remedy.

4.1.2 RCRA Tank Closure

The tank farm is undergoing closure. Under the terms of the 1992 *Consent Order to the Notice of Noncompliance* (DOE-ID 1992), DOE Idaho was required to permanently cease use of the tanks in the tank farm or bring the tanks into compliance with secondary containment requirements. DOE Idaho decided on the former. The *Second Modification to the Consent Order* (IDHW 1998) specified that DOE Idaho cease use of the tanks in the pillar and panel vaults (Tanks WM-182, -183, -184, -185, and -186, see Figure 2-1) by June 30, 2003, and the remaining tanks by December 31, 2012. Ceasing use of the tanks, as defined in the Consent Order, means that DOE Idaho had to empty the tanks down to their heels (i.e., the liquid level remaining in each tank was lowered to the greatest extent possible by the use of existing transfer equipment [IDHW 1998]). In terms of the "Idaho Hazardous Waste Management Act of 1983" (Idaho Code § 39-4401 et seq.) and RCRA, the tank farm is an interim-status hazardous waste management unit. As such, the requirements of 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," (IDAPA 58.01.05.009) apply to the tank farm closure. The five tanks in the pillar and panel vaults have been cleaned.

According to the *Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for Idaho Nuclear Technology and Engineering Center Tanks WM-182 and WM-183* (DOE-ID 2001), closure of tank farm tanks will be performed in phases. The current plan for which tanks would be closed during each phase is shown on Figure 4-1, along with the associated piping and valve boxes. Tanks WM-182 and -183 will be closed in the first phase. Closure of these two tanks will serve as the proof-of-process demonstration of waste removal, decontamination, and sampling techniques for closure of the remaining tank farm tanks. The partial closure plan for Tanks WM-184, WM-185, and WM-186 has been approved by IDEQ (Allred 2004). The closure plan states that the tank farm will continue to operate until 2012, while various parts of the facility are being closed. Final closure of any component of the tank farm will not be complete until all of the tanks have been closed and the RI/FS for OU 3-14 is completed. The final closure plan will address closure and any required postclosure care of the tank farm (DOE-ID 2003). A decision to close the unit as a landfill or as a RCRA/Hazardous Waste Management Act clean-closure will be determined during final closure, currently scheduled for December 31, 2012.

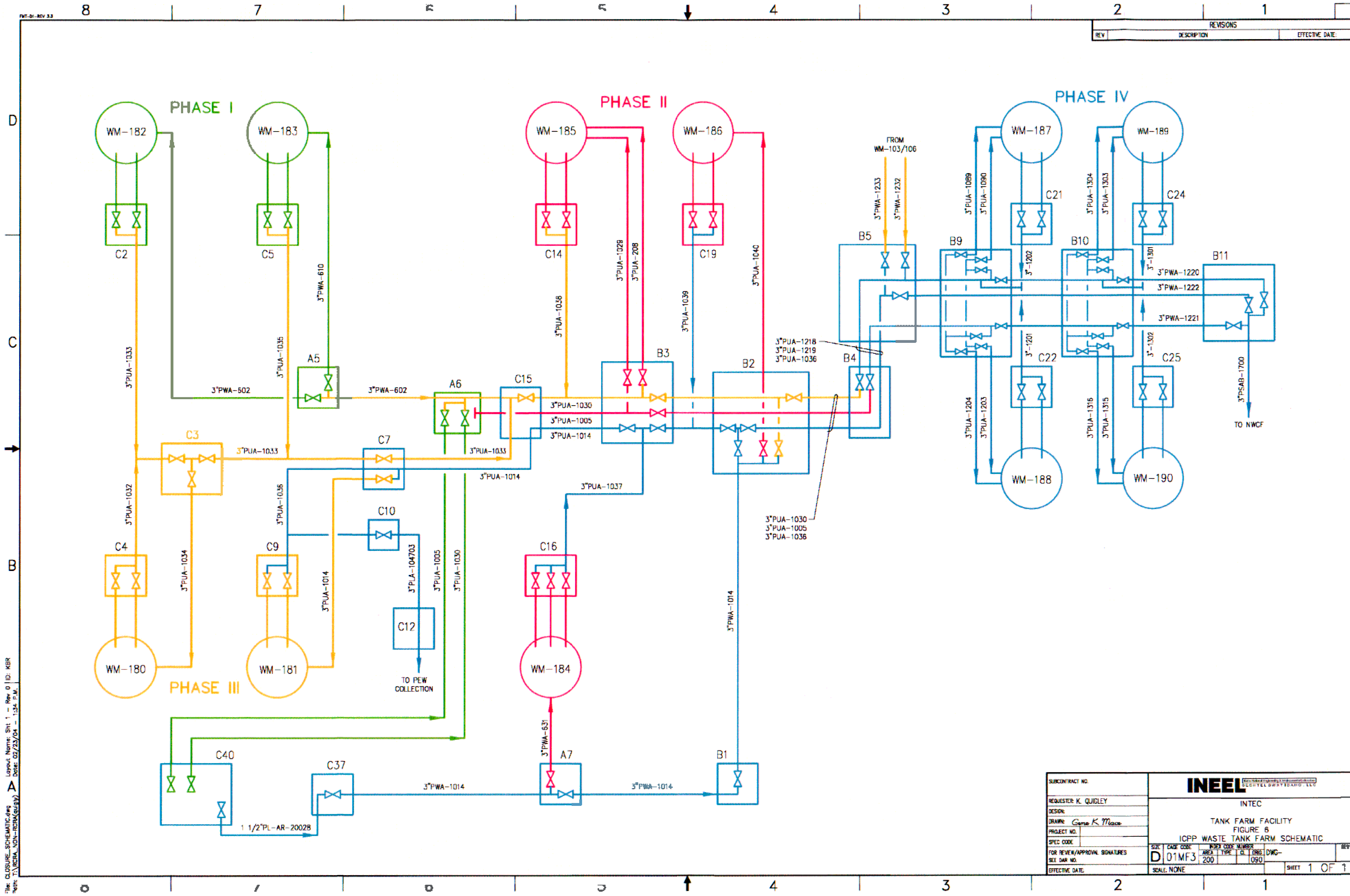

Figure 4-1. Current plan for which tanks will be closed during each phase.

DOE Idaho has established accelerated goals for closing the tank farm, including

- Treat SBW and ship off-Site by 2012
- Close the high-level waste tank farm tanks by 2012
- Clean up contaminated tank farm soil by 2020 (DOE-ID 2002).

The volume of SBW currently remaining in each tank and the type of vault containing each tank are shown on Figure 4-2. The sequencing of tank cleaning, stabilizing, and closure is prioritized based on the following criteria and strategies (National Resources Defense Council et al. 2003):

- Accelerate cleaning of tanks while resolving issues on the National Resources Defense Council vs. Abraham case (National Resources Defense Council et al. 2003), which prevents DOE Idaho from grouting the tank heels. Rather than grouting Tanks WM-182 and WM-183, cleaning of additional tanks (WM-184, WM-181, and WM-103 through WM-106) was accelerated and completed in FY 2004.
- Use the liquid waste management system to reduce the volume of liquids in the tanks and minimize the volume of newly generated liquid waste that needs to be stored in the tanks pending treatment.
- Operational constraints prevent tanks from being filled to capacity, thus increasing the number of tanks necessary to hold existing and newly generated liquid waste.

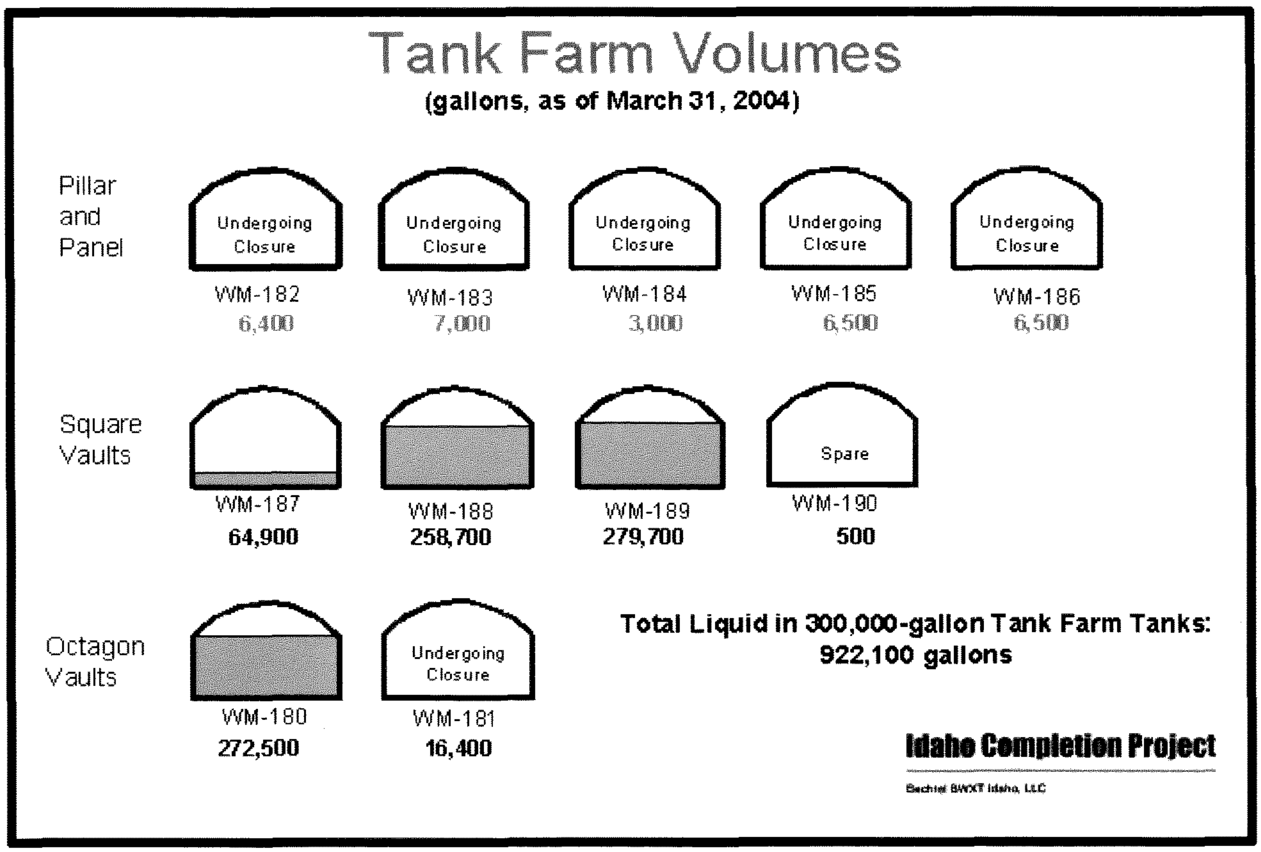

Figure 4-2. Tank farm volumes as of March 2004.

- One empty tank that has the capacity to hold the maximum volume of waste in any one tank must be available as an emergency spare.

- Store the remaining SBW in the tanks in WM-180 and the square vaults (WM-187 to -190) until SBW can be treated.

- SBW treatment is scheduled to begin in FY 2009.

- Clean tank WM-180 (on the west end) before cleaning the tanks in the square vaults (WM-187 to -190).

- Until the tanks are closed (grouted or otherwise stabilized), the piping to the tanks and the tank vaults and electrical lines to the instrumentation will remain in service to manage any water that may accumulate. The lines between the tank farm and the PEW evaporator that run down the middle of the tank farm and underlie Site CPP-31 will need to remain in service. No transfers would be planned during probing or drilling activities.

Although the tank closures can be re-sequenced to empty the west end of the tank farm first, operational constraints will still have to be mitigated to implement an early remedy. For example, existing infrastructure and active waste transfer lines support the entire tank farm, not just the west end. These constraints severely limit the remedy alternatives that can be implemented early without relocating the transfer lines and infrastructure. In addition, strict load limits exist in the tank farm and will remain in effect until the tanks are closed. Any permanent remedy implemented early must be compatible with these load limits until the tanks and valve structures are stabilized to withstand additional weight. Load limits are of particular concern for the early implementation of a permanent cap.

4.2 Strategies for Phased Early Remedy Implementation

Four options compatible with a phased implementation of an early remedy are removal of known hot spots (CPP-28, CPP-31, and CPP-79), hot spot in situ treatment, and two options for a phased landfill cap (early cap on the west end and early cap over the entire tank farm). A discussion of these options, along with a rough order-of-magnitude cost estimate, is provided in Sections 4.2.1 through 4.2.3. Because the extent of contamination is unknown at Site CPP-79 Deep, the cost estimates for hot spot removal or in situ treatment do not include this site.

4.2.1 Early Hot Spot Removal

If the remedy includes selective removal of contaminated soil, it is possible to implement this phase of the permanent remedy for the tank farm soil prior to tank closure. Due to accelerated schedules, Tanks WM-182 through -186 and WM-103 through -106 were cleaned and WM-181 is being cleaned in FY 2004. This means that all the west-side tanks are empty except for Tank WM-180. Once this tank is cleaned, it may be possible to remove most of the contaminated soil at the largest site (CPP-31), even if these west-side tanks are not yet closed.

However, Site CPP-31 is located adjacent to Tank WM-180, which is full of waste and not scheduled to be cleaned until FY 2009. Therefore, it may not be possible to remove soil from the southwest side of Site CPP-31 near this tank. Likewise, soil Sites CPP-28 and -79 are located south of Tank WM-181 in an area of buried lines that will remain active. An early excavation in these sites is possible but is complicated by the active transfer lines through the site. Early hot spot removal would cost approximately $15M. This estimate includes excavation and boxing of the contaminated soil, backfilling, and compaction but no treatment, disposal, or transportation of the waste other than transport to the

INEEL CERCLA Disposal Facility. This estimate assumes excavation of 10,420 yd^3 from CPP-31, 1,500 yd^3 from CPP-79, and 167 yd^3 from CPP-28. Removing the hot spots, combined with successful tank cleaning, could alleviate the need for a cap. If the ROD requires a permanent cap after hot spot removal, it would be installed after the closure of the tanks and demolition of the tank farm infrastructure.

4.2.2 Early In Situ Treatment of Soil

If the remedy includes in situ treatment of contaminated soil, it may be possible to implement this phase of the permanent remedy early. In situ treatment of soil is similar to hot spot removal in terms of the feasibility for early implementation of a phased remedy, and similar assumptions and strategies apply. Early in situ treatment is feasible if the remedy will not endanger the active tanks. In situ vitrification is not possible because of strict thermal limits imposed by SAR-107 to protect the active tanks. However, low-pressure grouting (solidifying with a permeation grout such as wax) or other stabilizing in situ treatment that would not jeopardize the performance of Tank WM-180 or disturb active buried tank farm infrastructure might be possible. Early in situ treatment would cost approximately $18M. This estimate assumes the same soil volumes as for early hot spot removal.

If early implementation of this remedy is performed, it could result in reduced infiltration and potentially alleviate the need to install a cap over the hot spots. Wax grouting would not be incompatible with later soil excavation and or capping as it is easily penetrated with a backhoe and aids in dust control due to its binding abilities. It also fills voids and may aid in supporting a subsequent cap.

4.2.3 Phased Landfill-Type Cap

If the remedy includes a phased landfill-type cap, two primary constraints render it difficult to implement early. These constraints include filling all the void spaces (e.g., tanks, lines, valve boxes) and removing all aboveground infrastructure that would protrude through the cap. These are discussed below, followed by an evaluation of possible re-sequencing options for tank closures.

A final cap cannot be installed until the void spaces of the empty and cleaned tanks are filled so that the tanks will provide a stable base for the final cover. A final cover cannot be installed until the empty tank and associated structures are stabilized to withstand the weight of additional overburden. The current plan for stabilizing (i.e., grouting) the tanks has been put on hold pending resolution of issues raised by Judge Winmill's decision (National Resources Defense Council et al. 2003). Additionally, installation of a final cap to control infiltration over the tanks and their associated piping, before the tanks are emptied of waste, is not feasible because continued access to the tanks through risers is needed for installation of washing equipment.

Additional surficial tank farm structures, including valve boxes, buildings, instrument houses and other utilities, exist at the surface of the tank farm and are needed until the tank farm is closed. Attempting to build a cap around numerous protruding structures would compromise the long-term infiltration control function of the cap. Short-term infiltration control using this approach would be marginally improved. Overall, this approach to execute an early remedy would result in reduced effectiveness and, most likely, increased cost of the final remedy.

The possibility of re-sequencing tank closures in order to implement an early partial cap was evaluated. With the exception of Tank WM-180, the tanks on the west end of the tank farm will be closed first. The feasibility of early installation of a partial cap on the west end was considered. Unless there is a fundamental change to the constraints outlined in Section 4.1, an early partial cap cannot be installed on the west end of the tank farm.

Tanks WM-180 through -186 underlie or are adjacent to Sites CPP-28, -31, and -79, which are the three largest known release sites and the sources of known contamination (see Figure 2-1). To implement a permanent landfill-type cap in a phased manner, all the tanks on the west side of the tank farm, including WM-180, would have to be closed earlier than the current plans. Tanks WM-182 through WM-186 and WM-103 through WM-106 have been cleaned, and Tank WM-181 is being cleaned. These tanks compose most of the tanks on the west side of the tank farm. However, a cap cannot be installed over the west side of the tank farm after closure of these tanks because Tank WM-180, at the southwest corner of the tank farm, would still be in use. Tank WM-180 is less than 20 ft from Tank WM-181, making the installation of a landfill-type cap over that area infeasible.

Tank WM-180 could be closed if its contents were transferred to either Tank WM-186 or WM-190, with the alternate tank serving as the dedicated spare. Transferring the contents of Tank WM-180 to Tank WM-190 would result in contaminating a tank that has never been used to store waste. Contaminating Tank WM-190 would result in additional time and cost (approximately $2.8M more to clean this tank), and generate waste, to clean a tank that otherwise would require minimal effort. Transferring the contents of Tank WM-180 to Tank WM-186, or using WM-186 as the dedicated spare (assuming the contents of WM-180 are transferred to WM-190), would require regulatory relief from the Consent Order. WM-186 is among the set of five tanks in pillar-and-panel vaults no longer in use per the Consent Order. However, it may be acceptable as a spare tank.

Finally, active lines from the PEW evaporator would have to be rerouted so that the lines under the west end of the tank farm could be taken out of service after the western-most tanks are closed. New piping would need to be built in order to manage newly generated liquid waste from the CPP-604 waste treatment building.

The re-sequencing of tank closures to accommodate early implementation of a final cap over the west side of the tank farm is possible. However, due to the extensive rerouting of active lines and valve boxes that would be required, this option significantly increases the costs over a nonaccelerated remedy. A rough order-of-magnitude cost estimate to replace just the active lines and valve boxes on the west end of the tank farm, and clean Tank WM-190, so that a partial cap can be installed on the west end of the tank farm is approximately $28M. This estimate assumes a new valve box will replace Valve Boxes C-40 and C-37 and new process lines and utilities will be routed to the east end of the tank farm. This is an estimate of the additional cost that would be incurred to accelerate the remedy and does not include tank closures for the other 10 tanks, closure of the existing piping, construction of the west end cap or the final cap, or demolition of the adjacent buildings.

A rough cost estimate to accelerate capping the entire tank farm is $73M. This includes the cost to reroute all of the active lines and valve boxes in the tank farm and build replacement tanks, vaults, pipes and valve corridor to hold the existing waste and an emergency spare tank. This estimate assumes three new 441,000-gal storage tanks, a new 16,900-ft^2 underground concrete structure, a new instrument building, new piping and electrical utilities, and modifications and additions to an existing valve box. These are the additional costs that would be incurred to accelerate the remedy and do not include closure of the tanks and piping, construction of the final cap, or demolition of the adjacent building.

These options for implementing an early remedy will be further evaluated in the FS. The costs will be determined more precisely and detailed assumptions presented.

5. CONCLUSIONS

This document evaluates the feasibility of selecting and implementing an early permanent remedy for the tank farm soil. Whether an early ROD is feasible depends, in part, on agreement regarding extent of remaining data gaps once Phases I and II are completed. With the DQOs outlined in the OU 3-14 RI/FS Work Plan (DOE-ID 2004), selecting an early remedy is achievable.

Completing an early ROD before 2010 is possible by initiating the BRA, modeling, and data collection activities in FY-04. If the final remedy includes hot spot removal or treatment, implementing an early phased remedy may be possible. Early hot spot removal or in situ wax grout appears feasible, but the remedial work would occur around active lines and the tanks needed to support ongoing tank farm operations. Early action on hot spots would be complicated due to the extensive tank farm infrastructure and can be expected to cost roughly $18M for in situ treatment or $15M for removal. Early phased implementation of a cap is constrained by the extensive infrastructure and void spaces in the tank farm. Re-sequencing the tank closures to facilitate implementation of a cap over the west side of the tank farm does not resolve these two major issues. To overcome these issues, the active lines would also have to be rerouted, the infrastructure replaced, and the waste transferred to a clean tank, which would need to be decontaminated later. The additional cost that would be incurred in order to accelerate this option is estimated to be approximately $28M. Alternately, $73M would be the additional funding that would be required to replace the entire tank farm tanks and infrastructure so a final cap can be installed early. These rough order-of-magnitude estimates represent the additional costs associated with acceleration of a capping remedy. They do not include the costs associated with a nonaccelerated remedy (cleaning and closure of the tanks, vaults, and lines, demolition of the adjacent buildings, and capping). These rough order-of-magnitude cost estimates will be further refined in the feasibility study and the costs more precisely determined.

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